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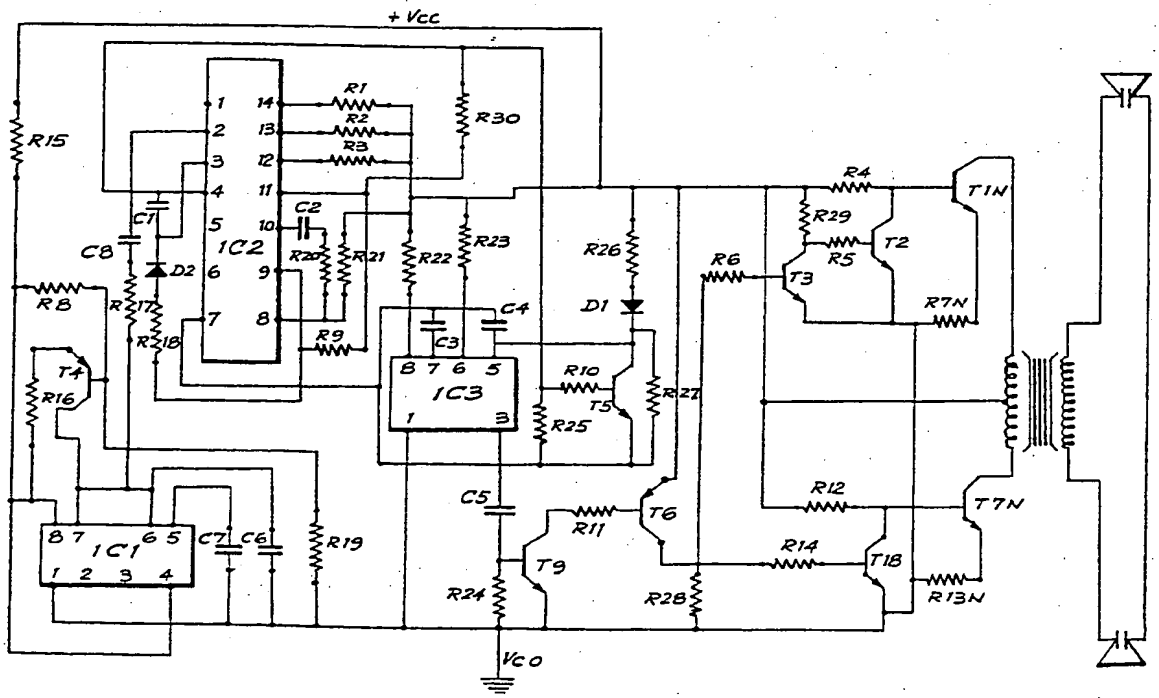
(54) Title: ELECTRONIC FREQUENCY MODULATOR



(57) Abstract

Electronic frequency modulator which combines a lower band frequency with an upper band frequency to produce a square wave output on transmission from a transducer. The present invention can be used as a method of protecting crops from crop pests.

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ELECTRONIC FREQUENCY MODULATOR

The present invention relates to an electronic frequency modulator of the type wherein a lower band frequency is transmitted on a carrier wave being an upper band frequency. The present invention has particular application in its use as an electronic scarecrow, however it will be apparent to those skilled in the art that the present invention is of wider application as a deterrent to animal and insect crop pests, and is not therefore to be limitively construed by the following detailed description of its use as an electronic scarecrow.

In Australia considerable damage is done to crops and in particular orchards by flying foxes (fruit bats) and birds which descend and devour or damage fruit prior to harvest.

In an average orchard of ten acres containing between three and four thousand fruit trees it is not uncommon for, from two to three million flying foxes, to descend on the orchard and completely devastate the fruit crop and even to break the secondary growth on the trees all within a time span of half an hour.

In order to prevent such destruction of crops, orchardists and growers presently use nets, electric wires and guns in an effort to at least save some of the crop.

These three presently used methods are only partially effective as both electric wires and guns are activated on a periodic cycle and the birds or bats soon learn when the deterrent is non-activated and netting of large areas of orchards or crops is both labour intensive and inefficient in coping with the extreme numbers of birds or bats that can descend on a crop or orchard.

The present invention seeks to substantially overcome or at least ameliorate to a great extent the above disadvantages.

In one broad aspect there is provided an electronic frequency modulator which combines a lower band frequency with an upper band frequency to produce a square wave

output on transmission from a transducer, preferably a peizo ceramic.

In a further aspect of the invention there is provided a method of protecting crops from crop pests using an electronic frequency modulator which combines a lower band frequency with an upper band frequency to produce a square wave output on transmission from a transducer, preferably a peizo ceramic.

The present invention generates acoustically pressurized air waves which affect the muscular and skeletal structure of the bird or bat in flight and the unpleasant sensation causes the bird or bat to divert its flight path to avoid the effect.

Whilst sonic and ultrasonic devices are known and have been tried in the past as a deterrent against birds and bats, they have proven ineffective because the bird or bat soon realises that it is only a noise and there is nothing physical preventing them from feeding.

Through lengthy trials it was discovered that only a specific modulated frequency corresponding with the bird or bat's wing beat would give an unpleasant effect causing the bird or bat to divert its flight path and avoid the effect. It was found that within certain species not every member of that species would be affected by the one modulated frequency.

The ultrasonic frequency effective in controlling crop pests was found to lie within the following ranges.

marsupials	10 - 25 KHz
birds	15 - 35 KHz
insects	40 - 80 KHz

Models are presently available for the specific applications as set out below.

MODEL	CROP PEST	LOWER BAND FREQUENCY INFRASONIC CPS	UPPER BAND FREQUENCY ULTRASONIC KHz
815	Crows, galahs, cockatoos	1-400	17-30

MODEL	CROP PEST	LOWER BAND FREQUENCY INFRASONIC CPS	UPPER BAND FREQUENCY ULTRASONIC KHz
825	Starlings, leathernecks, parrots (certain varieties only)	1-200	25-40
835	Sheep, cattle, kangaroos, pigs	1-100	20-25
845	Flying foxes, cormorants, pelicans, dogs, egrets, night herons, ducks	1-350	20-25
855	Rabbits, mice, white tail rats, possums, wombats	1-50	18-30

The present invention will now be described by reference to a preferred embodiment which is illustrated in the attached drawings in which

Fig. 1 is a schematic view of the preferred embodiment in use as an electronic scarecrow.

Fig. 2 is a circuit diagram of the electronic circuitry of the embodiment of Fig. 1.

The electronic scarecrow shown in Fig. 1 is used in a ten acre paddock and is designed to withstand extremes of weather and the normal handling of orchardists and farmers. The electronic scarecrow can be run either continuously or can be preset with a programmable timer to only operate when the crop pests are most prevalent. For larger operations several devices as shown in Fig. 1 can be spaced throughout the orchard or farm.

In Fig. 1 the commercial electronic scarecrow comprises a plurality of known transducer heads 1, mounted on a support column 2 by means of adjustable

mount 3. The support column 2 is stayed to the ground by conventional stays 4 supported on plate 5 on support column 2.

A power supply in the form of a battery 6 is connected to the power pack 7 containing the electronic timer switch, battery level indicator and circuitry as detailed in Fig. 2.

The components as above listed in Fig. 1 with the exception of the circuitry of Fig. 2 are all known and available components.

In Fig. 2 the circuitry comprises the following known electronic components:

COMPONENT LIST

R15	10 ohm 1/4 w resistor
R1	10 ohm 1/4 w resistor
R22	10 ohm 1/4 w resistor
R28	220 ohm 1/4 w resistor
R26	470 ohm 1/4 w resistor
R14,29,5	1K 1/4 w resistor
R18	1.2K 1/4 w resistor
R23	from 1K to 150K fixed component depending on unit, refer to data sheet
R11	4.7K 1/4 w resistor
R6	4.7K 1/4 w resistor
R24	220K 1/4 w resistor
R10	68K 1/4 w resistor
R30	470K 1/4 w resistor
R27	470K 1/4 w resistor
R9	560K 1/4 w resistor
R20	1M w resistor
R3	1.2M 1/4 w resistor
R21	1.5M 1/4 w resistor
R2	1.8M 1/4 w resistor
R17	5.6M 1/4 w resistor
R4,12	110 ohm 1 w resistor
R25	0-25K depending on data sheet attached
R8	0-100K depending on data sheet attached
R19	0-50K depending on data sheet attached
R16	2.7K 1/4 w resistor

	R7N	Not part of main circuit board 3.3 ohms 5 watt
	R13N	Not part of main circuit board 3.3 ohms 5 watt
	C8	TL .001 Ceramic 50V
	C2	TL 470 Ceramic 50V
	C3	NL .001 G cap 100V
	C4	TL .01 Ceramic 50V
	C5	TM .1/50 Monobloc X5V low profile
	C1	TM .1/50 Monobloc X5V low profile
	C6	NL .01 G cap 100V
	C7	NL .01 G cap 100V
	D2	IN 914A-P
	D1	IN 914A-P
	IC1	555 chips
	IC2	LM3900 chip
	IC3	566 chip
	T1N	2N3055
	T7N	2N3055
	T6	2N2907A-M
	T9, 3, 2	BSW64
	T4	DS 557
	T8, 2	GED44C8

The present invention is a combination of two frequencies, an upper and a lower band frequency modulated together to produce an FM effect on transmission from a piece of peizo ceramic.

The lower band frequency, referred to as infrasonic frequency, is produced through a linear ramp in a 555 IC working as an astable operation which when triggered produces a pulse applied to an IC LM 3900 (op-amp) producing a staircase generation system which ramps down from a 12 volts. A zena diode D1 supplies the offset and prevents pin 5 of the 566 chip approaching the 12 volt locking up the ramp output of T5 producing a linear range of sweep voltage.

The IC3 produces a square wave output in the form

of an FM signal which is applied to T9 via pin 3 of IC3 in the required ultrasonic frequencies. The combination is then applied to a common output amp configuration of known circuitry type. The infrasonic signal is to be at the same pulse length as the bird's wing beat. Any alteration to that frequency will have little effect on controlling of birds.

It will be apparent to those skilled in the art that the combination of an infrasonic pulse frequency modulated with an ultrasonic pulse and used as a deterrent for crop pests is unique; and modifications both to the design of the transmitter and the circuitry may be made without departing from the scope of the present invention.

THE CLAIMS:

1. An electronic frequency modulator which combines a lower band frequency with an upper band frequency to produce a square wave output on transmission from a transducer.

2. An electronic frequency modulator as claimed in claim 1 wherein the transducer is in the form of a peizo ceramic.

3. An electronic frequency modulator as claimed in claims 1 or 2 wherein the lower band frequency is pulsed with an upper band frequency pulse.

4. A method of protecting crops from crop pests using an electronic frequency modulator which combines a lower band frequency with an upper band frequency to produce a square wave output on transmission from a transducer.

5. A method of protecting crops from crop pests as claimed in claim 4 wherein the transducer is a peizo ceramic.

6. A method as claimed in claims 4 or 5 wherein the square wave output is of a frequency corresponding to the frequency of the particular crop pests wing beat.

7. A method as claimed in claims 4 or 5 wherein the square wave output is of a frequency corresponding to the frequency of the particular crop pests heart beat.

8. An electronic frequency modulator as herein described with reference to the attached drawings.

9. A method of protecting crops from crop pests as herein described.

10. An electronic frequency modulator as claimed in claim 1 to 3 which combines a lower band frequency in the range of 1-500 cps with an upper band frequency in the range of 10-80 KHz.

11. A method of projecting crops from crop pests as claimed in claim 4 to 7 which combines a lower band frequency in the range of 1-500 cps with an upper band frequency in the range of 10-80 KHz.

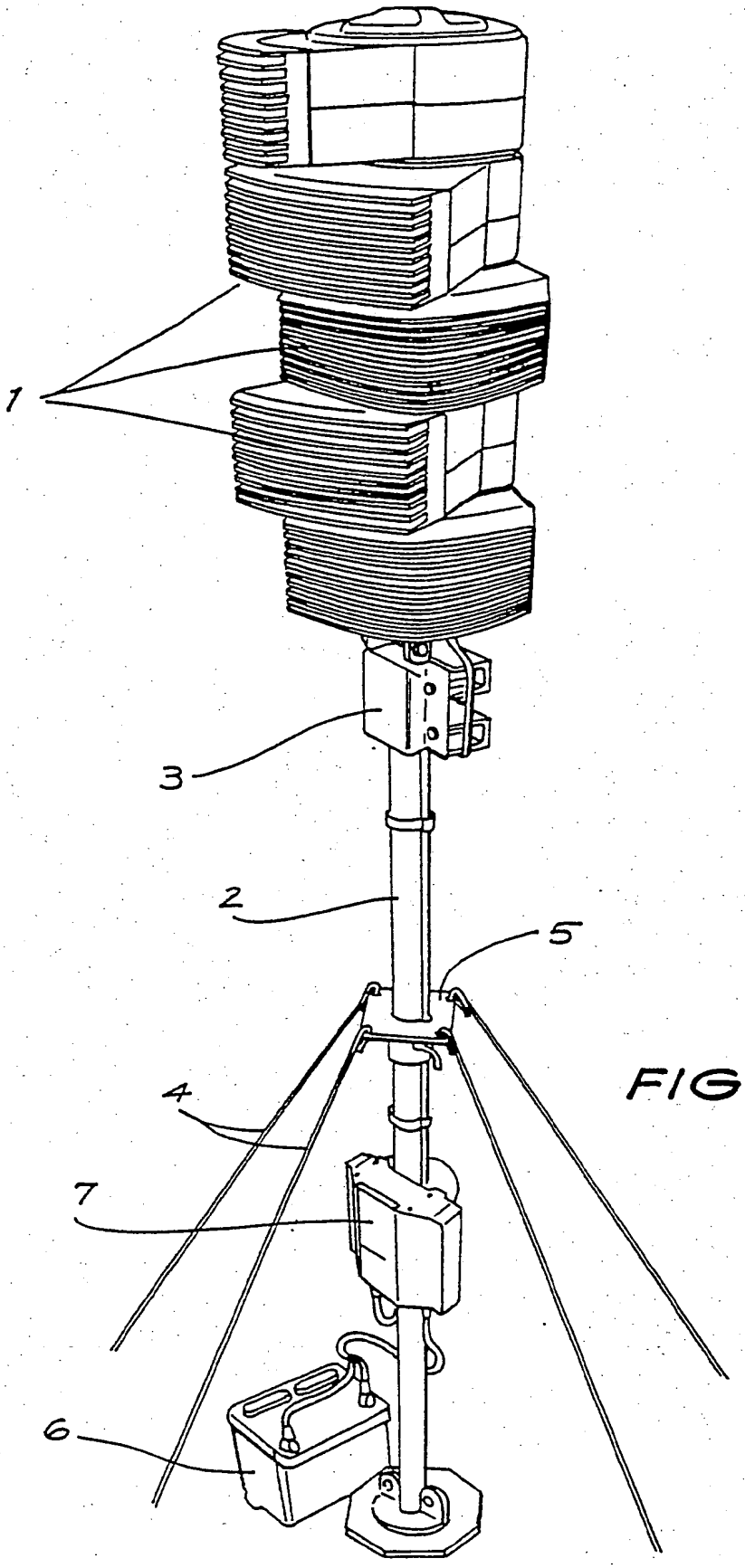
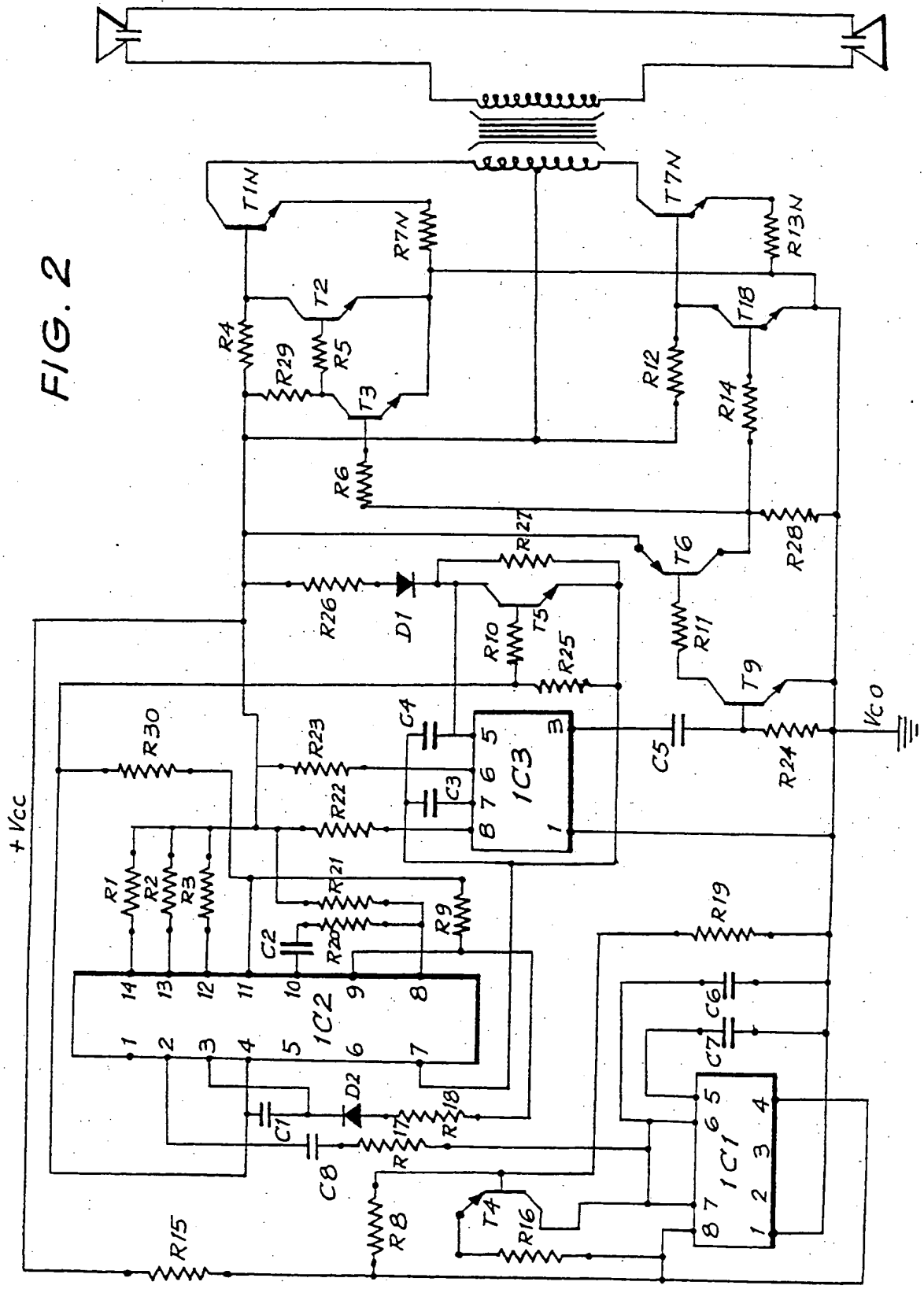


FIG. 1

FIG. 2



INTERNATIONAL SEARCH REPORT

International Application No PCT/AU 85/00258

I CLASSIFICATION OF SUBJECT MATTER

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.[4] A01M 29/02, H03K 7/06

II FIELDS SEARCHED

Minimum Documentation Searched

Classification System	Classification Symbols
IPC	A01M 29/02, H03K 7/00, 7/06

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched

AU : IPC as above, Australian Classification 05.52

III. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
X,Y	AU,B, 62394/80 (536442) (CARSON) 2 April 1981 (02.04.81)	(1-5,8-11)
P	AU,A, 35990/84 (ESPANOLA PTY LTD) 13 June 1985 (13.06.85)	(1-5,8-11)
X,Y	GB,A, 1265441 (SONICTRON CORPORATION) 1 March 1972 (01.03.72)	(1-5,8-11)
P	EP,A2, 0129415 (TOKYO ELITE CO., LTD) 27 December 1984 (27.12.84)	(1-5,8-11)
X,Y	US,A, 4186387 (MOSCHGAT) 29 January 1980 (29.01.80)	(1-5,8-11)
X,Y	US,A, 3872472 (MOSCHGAT) 18 March 1975 (18.03.75)	(1-5,8-11)
X,Y	FR,A, 2479652 (RELLE) 9 October 1981 (09.10.81)	(1-5,8-11)
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X,Y	GB,A, 642097 (SADIR-CARPENTER) 30 August 1950 (30.08.50)	(1-5,8-11)

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
9 January 1986 (09.01.86)	(17-01-86) 17 JANUARY 1986
International Searching Authority	**Signature of Authorized Officer**
Australian Patent Office	R. TOLHURST

Form PCT/ISA/210 (second sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 85/00258

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Members			
EP 129415	JP 60002134				
US 4186387	AR 218044	AU 30092/77	BE 860422		
	BR 7707384	DE 2748637	FR 2369795		
	GB 1555435	JP 53086376	NL 7711886		

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